

PATENT APPLN. NO. 10/786,593
RESPONSE UNDER 37 C.F.R. § 1.116

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REMARKS

Claim 1 has been amended to limit the heat resistant binder contained in the sintered product of a foamed metal containing silicon as an active material and a heat resistant resin to polyimide. Claim 13 has been canceled.

Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 10-223220 (hereinafter: JP '220) in view of Vaccaro et al. (U.S. Patent No. 5,738,907) (hereinafter: "Vaccaro") as evidenced by Onodera et al. (U.S. Patent No. 5,506,016) (hereinafter: "Onodera"). This is essentially the same rejection that was made in the first action. However, the Office has included Onodera in the rejection as a teaching that polyethylene, polypropylene and cellulose disclosed as binders in JP '220 are heat-resistant resins and that polyimide is functionally equivalent to polyethylene, polypropylene and cellulose disclosed in JP '220.

As explained in the response to the first action, the negative electrode of the present invention, which is a sintered product of a foamed metal containing silicon as an active material and a heat resistant resin as a binder, provides a nonaqueous electrolyte secondary battery having excellent cycle characteristics. Such excellent cycle characteristics, which are demonstrated by the data

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of the examples of the present application, cannot be reasonably predicted from the proposed combination of JP '220 and Vaccaro.

In the present action, the Office has cited JP '220 as disclosing a sintered negative electrode comprising a silicon active material and a binder, where the binder includes polyethylene, polypropylene and cellulose. The Office has cited Vaccaro as teaching the use of a foamed metal containing an active material therein as a negative electrode for a nonaqueous electrolyte secondary battery and notes that the foams are processed to make them conductive by heating. The heating step is considered by the Examiner to be sintering. The Office concludes that it would have been obvious to modify the electrode of JP '220 by "incorporating the foamed metal of Vaccaro et al." (Action, page 4, lines 4-5).

Applicants respectfully submit that the Office has misconstrued the disclosure of Vaccaro. Vaccaro does not disclose the heating of a foamed metal containing an active material as suggested by the Office and does not disclose the heating or sintering of a foamed metal containing an active material and a binder and, more particularly, a polyimide binder.

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The heating disclosed in Vaccaro is the heating of a porous product that has been coated with a conductive coating as a prerequisite for electroplating. The heating is for the purpose of drying and/or curing the coating and, in certain embodiments, for setting a stretch of the porous product. The coated and stretched product is thereafter electroplated and the product is subjected to pyrolysis or combustion to decompose and remove the porous substrate and provide a foamed metal. It is this foamed metal that is then filled with an active material, or paste, to prepare an electrode. Vaccaro does not disclose that the paste contains a binder and does not suggest heating (or sintering) of the foamed metal that has been filled with the paste of active material to sinter the filled foam material (or for any purpose).

It is noted at this point that the heating cited by the Office as described in Col. 5, lines 45-61, is the heating of a polymer foam coated with a conductive coating. Even if the Office construes such heating to be sintering (which the reference describes as drying and/or curing), such teaching is not relevant to the sintering of a foamed metal containing an active material and polyimide binder as in the present invention. The heating temperatures described in Col. 7, lines 20-23, of Vaccaro

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identified by the Office are not for the heating of a foamed metal containing an active material, but, instead, are temperatures of the heating of a coated and stretched porous polymer substrate.

For the above reasons, no motive is provided to substitute he metal foam of Vaccaro, with or without a paste filling, for the layer of active material and binder of the electrode of JP '220 and to heat or sinter the resultant, and to use such resultant electrode as a negative electrode in a nonaqueous electrolyte secondary battery and such substitution will not result in a nonaqueous electrolyte secondary as recited in the claims of the present application.

For the above reasons, the combination of JP '220 and Vaccaro, with or without Onadera, cannot support a case of *prima facie* obviousness of the claims of the present application and removal of the 35 U.S.C. 103(a) rejection is in order.

The foregoing is believed to be a complete and proper response to the Office Action dated August 4, 2006, and is believed to place this application in condition for allowance. If, however, minor issues remain that can be resolved by means of a telephone interview, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number indicated below.

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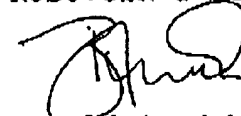
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In the event that this paper is not considered to be timely filed, applicants hereby petition for an appropriate extension of time. The fee for any such extension may be charged to our Deposit Account No. 111833.

In the event any additional fees are required, please also charge our Deposit Account No. 111833.

Respectfully submitted,

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